

METHOD AND ARRANGEMENT FOR IDENTIFYING SIMILAR PRE-STORED MEDICAL DATASETS

RELATED APPLICATION

[0001] This application claims the benefit of DE 102020207943.9, filed on Jun. 26, 2020, which is hereby incorporated by reference in its entirety.

FIELD

[0002] The present embodiments describe a method and arrangement for identifying similar pre-stored medical datasets, especially for comparison with a current case dataset, which includes radiological data, particularly of a tissue abnormality.

BACKGROUND

[0003] Prostate cancer is the most common cancer in men in developed countries. For more than a decade, magnetic resonance imaging (MRI) has been used to detect, precisely localize, and stage prostate cancer. As a response to the growing importance of a noninvasive assessment of the prostate gland using magnetic resonance imaging and the need to distinguish between benign processes and prostate cancer based on image features, the Prostate Imaging—Reporting and Data System (PI-RADS) was introduced in 2012. This reporting system serves to improve “the detection of clinically significant cancer.” The definition of clinically significant (sPC) and insignificant prostate cancer (inPC) is based on the histological Gleason score, which reflects the tumor aggressiveness on an ordinal scale and serves as the ground-truth in all prostate cancer studies.

[0004] Multiple attempts have been made in the past to validate the PI-RADS scoring system. The findings of these studies revealed one key limitation of the PI-RADS v2 assessment score: the false positive rate lowers the cancer detection. In summary, PI-RADS category 5 lesions are assumed very likely and PI-RADS category 4 lesions are assumed to likely contain sPC while PI-RADS category 3 lesions are considered to equivocally contain sPC. Clinical trials such as PRECISION and MRI-FIRST evaluated the performance of MRI targeted prostate biopsies and could demonstrate an improved detection of sPC.

[0005] The PI-RADS score in theory equals a probability score for the detection of sPC based on the image findings. This turns out to be true for PI-RADS 5 lesions with detection rates of sPC of over 90%. For PI-RADS 4 lesions though, the detection rates of sPC after biopsy range between 22% and 60%. For PI-RADS 3 lesions, sPC is found in 12% of the cases or even not at all. Therefore, the PI-RADS scoring system has limited capabilities in the differentiation of sPC and inPC.

[0006] Although the use of the PI-RADS scoring system allows a certain standardization of prostate MRI examinations, the interpretation is a difficult task due to heterogeneous signal changes from benign prostatic hyperplasia, inflammation, and scarring after biopsy mimicking or hiding the appearance of prostate cancer. Due to these overlapping image features, only a high level of expertise required for accurate interpretation can limit the interobserver variability.

[0007] The interobserver variability is determined by the different results of an investigation or observation procedure when using different observers. It is a measure of the

dependence of a clinical examination procedure on the person of the observer. If the variability is high, the sensitivity of the procedure and the specificity of the findings are strongly dependent on the examiner.

[0008] The two outlined problems (imperfect correlation between PI-RADS and Gleason scores and high interobserver variability) have so far been addressed by the use of computer-aided diagnosis (CAD) systems. Usually, the steps using a CAD system for cancer diagnosis are the following: lesion detection and lesion characterization.

[0009] However, urologists might need more information to decide on whether the patient should be biopsied or not. The second problem, the high interobserver variability, has not yet been specifically addressed.

SUMMARY

[0010] It is an object to reduce interobserver variability in evaluation of radiological data of a patient, in particular, in the assessment of prostate lesions based on MRI data.

[0011] This object may be achieved by the methods, the arrangements; and the magnetic resonance imaging systems of the claims.

[0012] According to one embodiment, a method for identifying similar pre-stored medical datasets for comparison with a current case (medical) dataset includes the following acts:

[0013] providing a current case dataset including radiological data of a patient;

[0014] providing a number of pre-stored medical datasets each including radiological data of a patient;

[0015] evaluating each case dataset according to a pre-defined AI-based method to obtain a number of definitive features for that case dataset;

[0016] comparing the definitive features of the current case dataset with the definitive features of each pre-stored medical dataset to identify a number of pre-stored medical datasets most similar to the current case dataset; and

[0017] outputting the identified number of most similar pre-stored medical datasets.

[0018] The present embodiments generally relate to comparison of radiological data, i.e. medical images from the inside of a patient. Embodiments of the present embodiments are described herein to give a visual understanding of methods for comparison in medical images. A digital image is often composed of digital representations of one or more objects (or shapes). The digital representation of an object is often described herein in terms of identifying and manipulating the objects. Such manipulations are virtual manipulations typically accomplished in the memory or other circuitry/hardware of a computer system. Accordingly, it is to be understood that embodiments of the present embodiments may be performed within a computer system using data stored within the computer system.

[0019] The case datasets include radiological data. In a simple embodiment, the radiological data may have the form of a pre-evaluated risk factor based on radiological data, such as e.g. the PI-RADS value. Preferably, the radiological data includes magnetic resonance imaging (MRI) images. However, it should be understood that the case datasets may include medical images of any suitable modality, such as, e.g., multi-parametric MRI (mpMRI), DynaCT, x-ray, ultrasound (US), single-photon emission computed tomography (SPECT), positron emission tomography (PET), etc. The